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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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IBM CORPORATION  
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BEAVERTON, OR 97006-6063

EXAMINER

ELMORE, REBA I

ART UNIT PAPER NUMBER

2187

DATE MAILED: 06/04/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

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## Office Action Summary

Application No.

09/507,261

Applicant(s)

LAIS ET AL.

Examiner

Reba I. Elmore

Art Unit

2187

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2002.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 22 March 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All   b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## DETAILED ACTION

1. Claims 1-20 are presented for examination.

### *Drawings*

2. The objection of Figures 1 and 2 is *withdrawn* due to the amendment.

### *Specification*

3. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

### *Claim Rejections - 35 USC § 102*

4. The rejection of claims 1-20 as being anticipated by Lovett is *maintained* and repeated below.
5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Lovett.

Lovett teaches the invention (claims 1, 10, 14 and 18-19) as claimed including a multimode computer system and method having a distributed shared memory with a remote node receiving a copy of a cache line stored in a home node, the system and method comprising:

a first node having multiple processors, a local memory and a remote cache (e.g., see Figures 2 and 3);

a system interconnect coupling the first node to the second node (e.g., see Figures 2 and 3);

a state machine located on the second node (e.g., see Figure 5);

a second node having multiple processors, a local memory and a remote cache (e.g., see Figures 2-3);

a remote node requesting a shared copy of a cache line that is stored on a home node (e.g., see col. 4, line 57 to col. 5, line 6);

receiving at the remote node a request to invalidate the cache line (e.g., see Table 1 in col. 5);

in response to the request to invalidate the cache line requesting an exclusive copy of the cache line is taught as updating a cache line which is in a state indicating it is the 'only cached copy' either consistent with memory or inconsistent with memory (e.g., see col.5, Table 1);

overwriting the cache line on the remote node without informing the home node that the cache line is no longer stored on the remote node (e.g., see col. 5, Table 1); and,

requesting a new copy of the cache line after overwriting the cache line (e.g., see col. 5, Table 1).

As to claim 2, Lovett teaches storing a shared copy of the cache line on the remote node and rolling out the cache line on the remote node prior to the request for a shared copy of the cache line without informing the home node of the rollout (e.g., see col. 5, Table 1).

As to claims 3 and 16, Lovett teaches the remote and home nodes do not use a traditional directory to track the locations of cache lines but using a doubly linked sharing list (e.g., see 4, line 58 to col. 5, line 6).

As to claim 4, Lovett teaches issuing a request for the cache line from a processor of the home node at approximately the same time the request for the shared copy of a cache line is received from the remote node (e.g., see col. 8, lines 20-26).

As to claims 5 and 11, Lovett teaches discarding a response to the request for the shared copy of cache line after receiving the invalidate request (e.g., see col. 7, lines 18-48).

As to claim 6, Lovett teaches passing data between the nodes using a system interconnect that includes a dualport RAM controlled by at least one state machine (e.g., see Figure 3)

As to claim 7, Lovett teaches a state machine in the remote node which remains in a first pending state upon requesting a cache line (e.g., see col. 5, Table 1);

if while in the first pending state storing the cache line in a cache in the remote node and transitioning to a dirty or fresh state when receiving the cache line (e.g., see col. 5, Table 1);

if while in the first pending state transitioning to a second pending state when a request is invalid (e.g., see col. 5, Table 1); and,

while in the second pending state discarding the cache line and issuing the request for an exclusive copy of the cache line upon receiving the cache line (e.g., see col. 5, Table 1).

As to claim 8, Lovett teaches the multimode computer system includes multiple processors at each node arranged in an unordered network (e.g., see Figure 1).

As to claim 9, Lovett teaches the multimode computer system includes at least two nodes but it is inherent the system could be one two nodes (e.g., see Figure 1).

As to claim 12, Lovett teaches receiving a processor request on the home node for control of a cache line (e.g., see col. 7, lines 1-48);

checking local tags to determine if another node has a shared copy of the cache line (e.g., see col. 7, lines 1-48); and,

sending the invalidate request to the remote node because the home node was not notified that the remote node has overwritten its copy of the cache line upon determining another node has a shared copy (e.g., see col. 7, lines 1-48).

As to claim 13, Lovett teaches receiving an exclusive copy of the cache line at the remote node (e.g., see col. 5, Table 1).

As to claim 15, Lovett teaches snoopy cache protocol engines (e.g., see Figure 3).

As to claim 17, Lovett teaches the remote node performs silent rollouts of data (e.g., see col. 5, Table 1).

As to claim 20, Lovett teaches receiving the memory block of interest on the second node (e.g., see col. 9, lines 48-58); and,

rolling out memory block of interest on the second node without informing the first node of the rollout (e.g., see col. 5, Table 1).

***Response to Applicant's remarks***

7. Applicant's arguments filed March 22, 2002 have been fully considered but they are not persuasive

8. In response to applicant's remarks concerning the reference not teaching the receiving on the remote node a request to invalidate the cache line while waiting for the requested cache line,

the invalidation must take place before remote node can have exclusive ownership of the cache line. No two nodes can have the ability to change the content of the cache line due to coherency constraints within the system. Additionally, the changing of the status of cache lines within the memory subsystems is not instantaneous but the status changes occur while other activities are taking place. An exclusive state can only be granted to a requesting node if the other copies of the cache line are put in a status which does not allow changes to the cache line by any other node. This would require an invalidation of the other copies of the cache lines.

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

### ***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Reba I. Elmore, whose telephone number is (703) 305-9706. The examiner can normally be reached on M-TH from 7:30 a.m. to 6:00 p.m. EST.

If attempts to reach the examiner by phone fail, the art unit supervisor for 2187, Do Yoo, can be reached for general questions concerning this application at (703) 308-4908.

Additionally, the official fax phone number for the art unit is (703) 746-7239. The after-final fax phone number for the art unit is (703) 746-7238. The fax phone number for drafts or non-official communications is (703) 746-7240.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC receptionist at (703) 305-3800/4700.



Reba I. Elmore  
Primary Patent Examiner  
Art Unit 2187